We claim:

1. A process for partially oxidizing propene to acrylic acid in the gas phase under heterogeneous catalysis by initially conducting a starting reaction gas mixture 1 comprising propene, molecular oxygen and at least one inert gas and containing the molecular oxygen and the propene in a molar $O_2:C_3H_6$ ratio of ≥ 1 in a first reaction stage at elevated temperature over a first fixed catalyst bed

   - whose shaped catalyst bodies are annular,

   - whose active composition is at least one multimetal oxide I of the general formula

   $$Mo_{12}X^1_aX^2_bX^3_cX^4_dX^5_eO_n \qquad (I),$$

   where the variables are defined as follows:

   X^1 = at least one element from the group comprising Bi, Co and Ni,
   X^2 = at least one of the two elements W and Nb,
   X^3 = at least one of the two elements Fe and Cr,
   X^4 = at least one element from the group comprising K, Cs and Sr,
   X^5 = at least one element from the group comprising Si, Al and Zr,
   a = from 5 to 10,
   b = from 0 to 4,
   c = from 2 to 5,
   d = from 0.02 to 0.15,
   e = from 0.5 to 4, and
   n = a number which is determined by the valency and frequency of the elements in I other than oxygen,

   - whose volume-specific activity in the flow direction of the reaction gas mixture over the first fixed catalyst bed is either constant or increases at least once, and

   - whose active composition does not change over the first fixed catalyst bed,

   in such a way that the propene conversion on single pass is ≥ 90 mol% and the accompanying selectivity of acrolein formation and also of acrylic acid by-production together are ≥ 90 mol%, the temperature of the product gas mixture leaving the first reaction stage is optionally reduced by direct cooling, or by

indirect cooling, or by direct and indirect cooling, secondary gas is optionally added to the product gas mixture in the form of molecular oxygen, or inert gas, or molecular oxygen and inert gas, and the product gas mixture is afterwards conducted as the starting reaction gas mixture 2 comprising acrolein, molecular oxygen and at least one inert gas and containing the molecular oxygen and acrolein in a molar $O_2:C_3H_4O$ ratio of ≥ 0.5 in a second reaction stage at elevated temperature over a second fixed catalyst bed,

- whose shaped catalyst bodies are annular,

- whose active composition comprises at least one multimetal oxide II of the general formula

$$Mo_{12}V_fX^6_gX^7_hO_m \qquad (II)$$

where the variables are defined as follows:

X^6 = at least one of the two elements W and Nb,
X^7 = at least one of the elements from the group comprising Sb, Cu, Ni and Fe,
f = from 1 to 5,
g = from 1 to 2,
h = from 1 to 4, and
m = a number which is determined by the valency and frequency of the elements in II other than oxygen,

- whose volume-specific activity in the flow direction of the reaction gas mixture over the second fixed catalyst bed increases at least once, and

- whose active composition does not change over the second fixed catalyst bed,

in such a way that the acrolein conversion on single pass is ≥ 90 mol% and the selectivity S^{AA} of the acrylic acid formation assessed over both reaction stages, based on converted propene, is ≥ 80 mol%,

wherein the starting gas reaction mixture 1 is composed of

from 6 to 15% by volume of propene,

from 4 to 20% by volume of water,
from ≥0 to 10% by volume of constituents other than propene, water, oxygen and nitrogen,
sufficient molecular oxygen that the molar ratio of molecular oxygen present to molecular propene present is from 1.5 to 2.5,
and the remainder up to 100% by volume of the total amount of molecular nitrogen.

2. A process as claimed in claim 1, wherein the starting reaction gas mixture 1 comprises from 6 to 15% by volume of water.

3. A process as claimed in claim 1 or 2, wherein the starting reaction gas mixture 1 comprises from ≥0 to 5% by volume of constituents other than propene, water, oxygen and nitrogen.

4. A process as claimed in claim 1, wherein the starting reaction gas mixture 1 is composed of

from 7 to 11% by volume of propene,
from 6 to 12% by volume ofwater,
from ≥0 to 5% by volume of constituents other than propene, water, oxygen and nitrogen,
sufficient molecular oxygen that the molar ratio of molecular oxygen present to molecular propene present is from 1.6 to 2.2,

and a remainder of molecular nitrogen up to 100% by volume of the total amount.

5. A process as claimed in any of claims 1 to 4, wherein

X^1 = at least one of the two elements Bi and Co,
X^2 = at least one of the two elements W and Nb,
X^3 = Fe,
X^4 = at least one of the two elements K and Cs,
X^5 = at least one of the two elements Si and Zr,
a = from 6 to 8,
b = from ≥0 to 2.5,
c = from 2 to 4,
d = from 0.04 to 0.1, and
e = from 1 to 3.

6. A process as claimed in any of claims 1 to 5, wherein

X^6 = at least one of the two elements W and Nb,
X^7 = at least one of the two elements Cu and Sb,
f = from 2 to 4,
g = from 1 to 2, and
h = from 1 to 3.

7. A process as claimed in any of claims 1 to 6, wherein the shaped catalyst bodies of the first fixed catalyst bed are annular unsupported catalysts.

8. A process as claimed in any of claims 1 to 7, wherein the shaped catalyst bodies of the second fixed catalyst bed are annular coated catalysts.

9. A process as claimed in any of claims 1 to 8, wherein the annular geometry of the shaped catalyst bodies in both fixed catalyst beds has the following dimensions:

- from 2 to 11 mm for the external annular diameter,
- from 2 to 11 mm for the annular length and
- from 1 to 5 mm for the wall thickness of the ring.

10. A process as claimed in any of claims 1 to 9, wherein the shaped catalyst bodies of the second fixed catalyst bed are annular coated catalysts whose support rings have a length of from 2 to 10 mm, an external diameter of from 2 to 10 mm and a wall thickness of from 1 to 4 mm.

11. A process as claimed in any of claims 1 to 10, wherein the shaped catalyst bodies of the first fixed catalyst bed are annular unsupported catalysts whose internal diameter is from 0.1 to 0.7 times the external diameter and whose length is from 0.5 to 2 times the external diameter.

12. A process as claimed in any of claims 1 to 11, wherein the shaped catalyst bodies of the second fixed catalyst bed are annular coated catalysts whose active composition content is from 10 to 30% by weight.

13. A process as claimed in any of claims 1 to 12, wherein the first fixed catalyst bed in the flow direction of the reaction gas mixture is structured as follows:

to a length of from 10 to 60% of the total length of the first fixed catalyst bed, a homogeneous mixture of shaped catalyst bodies and shaped diluent bodies and then, up to the end of the length of the first fixed catalyst bed, an undiluted bed of the same shaped catalyst bodies.

14. A process as claimed in claim 13, wherein the proportion by weight of the shaped diluent bodies in the homogeneous mixture is from 10 to 40% by weight.

15. A process as claimed in claim 13 or 14, wherein the homogeneous mixture extends to a length of from 20 to 40% of the total length of the first fixed catalyst bed.

16. A process as claimed in claim 15, wherein the proportion by weight of shaped diluent bodies in the homogeneous mixture is from 20 to 40% by weight.

17. A process as claimed in any of claims 1 to 16, wherein the second fixed catalyst bed in the flow direction of the reaction gas mixture is structured as follows:

to a length of from 10 to 60% of the total length of the second fixed catalyst bed, a homogeneous mixture of shaped catalyst bodies and shaped diluent bodies and then, up to the end of the length of the second fixed catalyst bed, an undiluted bed of the same shaped catalyst bodies.

18. A process as claimed in claim 17, wherein the proportion by weight of shaped diluent bodies in the homogeneous mixture of the second fixed catalyst bed is from 10 to 50% by weight.

19. A process as claimed in claim 17 or 18, wherein the homogeneous mixture of the second fixed catalyst bed extends to a length of from 20 to 40% by weight of the total length of the second fixed catalyst bed.

20. A process as claimed in claim 19, wherein the proportion by weight of shaped diluent bodies in the homogeneous mixture of the second fixed catalyst bed is from 20 to 45% by weight.

21. A process as claimed in any of claims 1 to 20, wherein the first reaction stage and the second reaction stage are carried out in a common tube bundle reactor.

22. A process as claimed in any of claims 1 to 20, wherein the first reaction stage and the second reaction stage are carried out in two tube bundle reactors connected in series.

23. A process as claimed in claim 21 or 22, wherein the reaction temperature in the first reaction stage is from 300 to 380°C and that in the second reaction stage is from 220 to 310°C.